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09/430,023	10/29/1999	TORU KOIZUMI	35.C13988	6679

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EXAMINER

HARRIS, TIA M

ART UNIT	PAPER NUMBER
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2615

DATE MAILED: 09/12/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/430,023

Applicant(s)

KOIZUMI ET AL.

Examiner

Tia M Harris

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5,6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Hayes et al (hereafter referred to as Hayes) (5105277).

Hayes discloses a solid-state image pickup device comprising a photoelectric converter (14), an input terminal for a signal amplifier (see Fig 2), a transfer switch (28) for transferring an electric charge from the photoelectric converter to the input terminal and a reset switch (38) for applying a reset voltage to the input terminal, wherein the device is adapted to input a pulse signal to the reset switch and the transfer switch in order to turn on the reset switch and the transfer switch simultaneously (see Fig 3;  $\Phi T2$  and  $\Phi R$ ).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-9, 11-13, 16-25, 27-29 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash et al (hereafter referred to as Guidash) (5986297) in view of Mendis et al (hereafter referred to as Mendis) (CMOS active pixel image sensors for highly integrated imaging systems).

**(Claims 1 and 17)** Guidash discloses a solid-state image pickup device comprising a photoelectric converter (12), a transfer switch (16) for transferring an electric charge from the photoelectric converter and a reset switch (17), wherein the device is adapted to input a pulse signal to the reset switch and the transfer switch in order to turn on the reset switch and the transfer switch simultaneously (see Fig 3A; col 4, lines 43-44 and 46-47). Guidash further states that since the reset level can be obtained after a read operation, amplifier offset cancellation can be accomplished (col 4, lines 52-54), however, Guidash does not specifically disclose an input terminal for a signal amplifier, the transfer switch transferring electric charge to the input terminal and the reset switch applying a voltage to the input terminal.

Mendis discloses a CMOS active pixel sensor comprising a photoelectric converter, an input terminal for a signal amplifier (leading out of the floating diffusion (FD) region; see fig 3 (a)), a transfer switch (TX) for transferring electric charge to the input terminal and a reset switch (R) applying a voltage to the input terminal.

It would have been obvious to one having ordinary skill in the art at the time the invention was made that it is a well known configuration of an image pick-up device to have a lead from the FD region to an amplifier, as illustrated by Mendis, and to incorporate this configuration into the device of Guidash, and it is obvious to configure the device with an amplifier that provides a higher quality output signal.

**(Claims 2 and 18)** Guidash further discloses the reset voltage applied to the input terminal by means of the reset switch is selected to be higher than the depletion voltage defined as a reverse bias voltage sufficiently high for substantially depleting the semiconductor region of the photoelectric converter (see figs 3A and 3B; the higher reset voltage causing the region of the reset gate to be deeper than the region of the photoelectric converter causing the converter depletion as shown).

**(Claims 3 and 19)** Guidash further discloses the photoelectric converter comprises a buried type photodiode (see figs 1A and 1B).

**(Claims 4 and 20)** Guidash further discloses the transfer switch is a switch for depletion-transferring the electric charge stored in the photoelectric converter (see figs 3A and 3B; col 4, lines 42-46, 58-64).

**(Claims 5 and 21)** Guidash inherently discloses the transfer switch is a switch for transferring the electric charge stored in the photoelectric converter, leaving part of the electric charge in the photoelectric converter, in that there is not 100% charge transfer (col 5, lines 25-30).

**(Claims 6 and 22)** Guidash further discloses the reset voltage is so selected as to make the potential energy of the input terminal lower than the potential energy of the photoelectric converter when the transfer switch and the reset switch are on (see figs 3A and 3B).

**(Claims 7 and 23)** Guidash further discloses that antiblooming is controlled by adjusting the electrostatic barrier to the vertical overflow drain (VOD) such that it is deeper than the off potential for the transfer gate (col 6, lines 17-20), and that antiblooming control can be done similarly with a lateral overflow drain (LOD) (col 6, lines 26-28). Mendis discloses the voltage for the transfer switch is 2.5V, and the voltage for the photoelectric converter is 5V (pg 189, section B, lines 1-9), thus the transfer switch is made half-open (because uses half the voltage) to cause any excessive electric charge to flow to the input terminal during the storage period of the device. This is an alternate way of performing the antiblooming function.

**(Claims 8 and 24)** Mendis further discloses the resetting operation of turning on both the transfer switch and the reset switch is conducted on a row-by-row basis for the photoelectric converter (pg 189, section B, lines 11-15).

**(Claims 9 and 25)** Guidash further discloses the architecture and method of operation taught eliminates image artifacts caused by line by line integration, wherein the simultaneous turn on of the transfer and reset switches is performed simultaneously for each pixel, and done once per frame. Thus, the resetting operation of turning on both the transfer switch and the reset switch is conducted at once for all the rows (col 3, lines 20-24; col 4, lines 42-47, 58-65).

**(Claims 11 and 27)** Mendis further discloses the photoelectric converter, the input terminal for a signal amplifier and the transfer switch are arranged on a same semiconductor substrate (see fig 3 (a)).

**(Claims 12 and 28)** Mendis further discloses the input terminal is a diffusion region (floating diffusion region (FD)) (see fig 3 (a)).

**(Claims 13 and 29)** Guidash further discloses the photoelectric converter is a photodiode comprising a first semiconductor region of a first conductivity type (P) formed in a semiconductor substrate, a second semiconductor region of a second conductivity type (N type within the photoelectric converter) located within the first semiconductor region and a third semiconductor region of the first conductivity type located between the second semiconductor region and an insulation film formed on the principal surface of the semiconductor substrate (portion illustrated between photoelectric converter (12) and film illustrated by the hatched portion; see figs 1A and 1B).

**(Claims 16 and 32)** Guidash further discloses a step of turning on the reset switch and the transfer switch simultaneously, before storing an electric charge, to eliminate an electric charge of the photoelectric converter (col 4, line 41 – col 5, line 41; reset operation performed first, followed by the frame integration operation, and then the transfer and storage operations).

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5. Claims 10 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash in view of Mendis as applied to claim 1 above, and further in view of Alford et al (hereafter referred to as Alford) (5233428).

The combined invention of Guidash and Mendis discloses an image pickup device as discussed above, but does not specifically disclose the resetting timing of turning on both the transfer switch and the reset switch is modified depending on the quantity of light entering the photoelectric converter.

Alford discloses an electronic exposure control system for a solid-state image sensor wherein exposure control is modified based on the quantity of light entering the sensor (see fig 2; col 4, lines 54-64).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to reset the turning on of both the transfer switch and reset switch in the combined invention of Guidash and Mendis, in the manner taught by Alford in order to optimize exposure time for any light level.

6. Claims 14 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash and Mendis in view of Clark.

The combined invention of Guidash and Mendis discloses a solid-state image pickup device as discussed above, but does not specifically disclose a mechanical shutter for defining the exposure time of the solid-state image pickup device.

Clark discloses an electronic exposure control system for an active pixel CMOS image sensor, and teaches that it is important to provide shutter means for limiting the exposure of pixels to incoming radiation, whether by using a mechanical shutter or electronic shutter (col 1, lines 47-65).

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It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a mechanical shutter in the device of Guidash since, as taught by Clark, that shuttering means for an image sensor can be provided for by either a mechanical shutter or electronic shutter. Using a mechanical shutter would be further obvious in that it would provide a simpler construction for an imaging device because there will not be a need to shield parts of the device as performed by Guidash.

7. Claims 15 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash and Mendis in view of Clark as applied to claim 14 above, and further in view of Mizoguchi et al (hereafter referred to as Mizoguchi) (5959669).

The combined invention of Guidash, Mendis and Clark discloses a solid-state image pickup device as discussed above, but does not specifically disclose the photoelectric charge storage period is defined by the resetting operation of the solid-state image pickup device and the opening/closing operation of the mechanical shutter.

Mizoguchi discloses an image pickup apparatus wherein one of the exposure methods used is a hybrid shutter method in which charge storage for an exposure cycle is started by clearing charge by means of an electronic shutter and the exposure cycle is completed by closing iris blades (35a and 35b) of a mechanical shutter (col 14, lines 26-29, 45-62).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate an electronic shutter and mechanical shutter in the combined image pickup device of Guidash, Mendis and Clark, in the manner taught by Mizoguchi, in order to allow the device to perform photography on a line-by-line as well as a frame-by-frame basis, thus increasing the usability of the device.



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**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tia M Harris whose telephone number is 703-305-4807. The examiner can normally be reached on M-F 8:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Christensen can be reached on 703-308-9644. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4700.

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9/8/03



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